Trends and Technology in Coatings for Spray Foam

Matthew Lendzinski – The Dow Chemical Company
Agenda

- The Roof Coating Market
  - Where is the growth?

- Technologies for Roof Coatings
  - Changes to silicones
  - Next-gen Acrylcs
  - Thermochromic pigments
  - Nanotechnology

- Questions
Roof Coating Types

- **Asphaltic**
  - Pros: Cost
  - Cons: Not reflective

- **Acrylics**
  - Pros: Low VOC, workability, reflective
  - Cons: Resistance to ponded water

- **Polyurethanes**
  - Pros: Tensile strength, durability, ease of maintenance
  - Cons: UV stability, cost, VOC

- **Silicones**
  - Pros: Elongation and tensile strength
  - Cons: Workability, cost, recoatability, dirt pickup
Acrylic Monomer Options

Textiles, Non-woven Fabric Binders

Adhesives

Caulks

Paper Coatings

Architectural Coatings

Industrial Coatings

Floor Polishes

"Soft" Monomers
BA
2-EHA

Combinations
BA/MMA

“Hard” Monomers
MMA
BMA

Increasing Glass Transition Temperature
Polymer Morphology

Monodispersed Latex

Bimodal Particle Size

Polymer Blends

Core/Shell Morphology

Multi Domain Morphology

Multilobe Morphology

Hollow Sphere Polymers

Polymer-Pigment Composite
Acrylic Polymer Design

Monomer Selection
- Tg
  - Film rheology
  - Hand
- Functionality
  - Adhesion
  - Mechanical stability
- Molecular Weight
  - Film strength
  - Cohesive strength
- Physical
  - Solids residuals
  - Viscosity response
- Process Parameters
  - Post crosslinking
  - Heat resistance
  - Tack
  - Heat resistance
  - pH
  - Viscosity
  - Surface tension
  - Mechanical stability
  - Flow and leveling
  - Film clarity
  - Particle Size Distribution
The Roof Coatings Market

- Less than 1/3 of coated roofs are spray foam
- Foam continues to be 4% of US roofs according to NRCA
- Few coating manufacturers do both foam and non-foam
- Coating industry focus on TPO and asphalt emulsion
- Foam industry focus on interior foam

Regional Share of Roof Coatings Market (by sales)

- APAC: 11%
- EMEA: 22%
- LA: 18%
- NA: 50%
What’s new for coatings? (Silicones)

- Rapid change over the last 5 years
  - Newer high solids (92-97%) formulations
  - Lower VOC content than previous product generations
  - Expanded adhesion to many surfaces

- Other elements are still the same
  - Systems are typically fast dry / fast cure
  - Recoatability can be an issue, even with another silicone
  - Surface can be slick and can get dirty
What’s new for coatings? (Acrylics)

- Better water resistance
  - No peel off
  - No blisters
- Difficult for a water based system
- Lower water absorption
- Maintain vapor permeance
  - breathable but waterproof
- Water resistance in fewer coats
- Easy application
Thermochromic Pigments in Roof Coatings

Figure 2. Transition phase of thermochromic brown (a), (b), and blue (c), (d), (e) coatings. Thermochromic coatings are on the left side, becoming white as temperature rises above 30°C. On the right side color-matched common and cool coatings are presented.

(a) thermochromic 30°C common
(b) thermochromic 42°C common
(c) thermochromic 30°C cool
(d) thermochromic 37°C cool
(e) thermochromic 42°C cool

Nanotechnology in Coatings

- Nanotechnology – Use of particles that are between 1-100 nanometers
- Many Paint binders are made to be less than 100 nanometers
  - Roof coatings are typically 200+ nanometers when supplied
- Most existing nanotechnology in coatings is around pigments
  - Nano-titanium dioxide provides UV resistance but is visually clear
    - Can be used in clear coatings and things like pollution control systems
  - Normal titanium dioxide (TiO₂) is 200-350 nm

UV-radiation

The smaller and finer the ZnO particle distribution the higher the protection!
What will the future bring?

- **Commercial**
  - Industry Consolidation
  - New Start-ups

- **Technical**
  - Changing Standards
    - ASTM D6083
    - New standards
    - Building Codes
  - New Technology
    - More robust products
    - More versatile products
Questions

Matthew Lendzinski
Field Marketing Manager, Construction Chemicals
The Dow Chemical Company
MLendzinski@dow.com
215.592.2592